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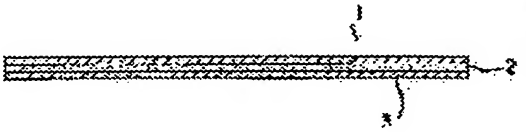
## (54) SHEET-FORM HEATING ELEMENT, AND ITS MANUFACTURE

(57)Abstract:
PROBLEM TO BE SOLVED: To provide a sheet-form heating element wherein a heating composition is held under a stable state, and also, which can be used by cutting into an optional shape or size.
SOLUTION: On the upper surface of a sheet-form article 3 comprising paper or a nonwoven fabric having air permeability and water absorbing property, a heating composition 2 in which a resin having a heat-melting property is mixed, and which heats under the existence of air, is held, and on the upper layer, a sheet-form article 1 comprising paper or a nonwoven fabric having air permeability and water absorbing property is superposed, and after they are formed into a sheet-form by a heat-compression by a heat-compressing machine, water or an inorganic electrolyte solution is infiltrated, and the heating composition 2 is held under a stable state, and at the same time, the sheet-form heating element can be used by cutting into an optional shape or size, and the usability is greatly favorable.





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## CLAIMS

[Claim(s)]
[Claim 1] The sheet-like heating element characterized by to infiltrate water or an inorganic electrolyte water solution into it after fabricating the sheet-like object which consists of the paper or the nonwoven fabric which holds the exoergic constituent which generates heat under existence of the air which mixed the resin which has thermofusion nature, and has permeability and absorptivity in the upper layer in the shape of a sheet by heating compression of a superposition heating compressor on the top face of the sheet-like object which consists of the paper or the nonwoven fabric which has permeability and absorptivity.
[Claim 2] On the top face of the sheet-like object which consists of the paper or the nonwoven fabric which has permeability and absorptivity The exoergic constituent which generates heat under existence of the air which mixed the resin which has thermofusion nature is held. The sheet-like heating element characterized by infiltrating water or an inorganic electrolyte water solution from the field which has permeability and absorptivity after fabricating the sheet-like object which becomes the upper layer from the paper of non-permeability and non-absorptivity, a nonwoven fabric, or a resin film in the shape of a sheet by heating compression of a superposition heating compressor.
[Claim 3] The sheet-like heating element according to claim 1 or 2 characterized by mixing the resin which has thermofusion nature in order that an exoergic constituent may use reduced iron powder, activated carbon or reduced iron powder, activated carbon, and a water retention agent as a principal component and may use mixed powder of the exoergic constituent as a sheet-like Plastic solid.
[Claim 4] The mixed powder of the exoergic constituent which generates heat under existence of the air which mixed the resin which has thermofusion nature on the top face of a sheet-like object is held. The voidage of the sheet-like heating element fabricated by heating compression of a superposition heating compressor in the shape of a sheet the sheet-like object which becomes the upper layer from the paper or the nonwoven fabric which has permeability and absorptivity 30 - 85%, The sheet-like heating element according to claim 1 or 2 characterized by thickness being 0.2-10mm.
[Claim 5] The mixed powder of the exoergic constituent which generates heat under existence of the air which mixed the resin which has thermofusion nature on the top face of a sheet-like object is held. The sheet-like object which becomes the upper layer from the paper or the nonwoven fabric which has permeability and absorptivity by heating compression of a superposition heating compressor The permeability of the sheet-like heating element fabricated in the shape of a sheet is JIS. Sheet-like heating element according to claim 1 or 2 characterized by being 0.1-20sec / 100ml with the test method of S-8117.
[Claim 6] The sheet-like heating element according to claim 1 or 2 by which 2 and thickness are 10-2000 micrometers 10cm, and the coefficient of water absorption of the sheet-like object which consists of the paper and the nonwoven fabric which have permeability, water flow nature, and absorptivity is being [ a basis weight / 5 - 800 g/m2 ] characterized 0.3-10g / when basis weights are 5 - 600 g/m2 and a nonwoven fabric in the case of paper.
[Claim 7] The sheet-like heating element according to claim 1 or 2 which it is characterized by

the thermoplastics powde[redacted]th which the resin which has the thermo[redacted]n nature mixed to an exoergic constituent is chosen from polyamide powder, polyester powder, polyethylene powder, ethylene acetic-acid vinyl copolymer powder (EVA), polyurethane powder, etc. using at least one or more sorts as a principal component, and is the addition of the three to 30 section to the exoergic constituent 100 section.

[Claim 8] The sheet-like heating element according to claim 1 or 2 characterized by the amount of sinking in of water or an inorganic electrolyte water solution being an addition of the ten to 50 section to the sheet-like heating element 100 section.

[Claim 9] The manufacture approach of the sheet-like heating element characterize by to infiltrate water or an inorganic electrolyte water solution into it after fabricate the sheet-like object which consist of the paper or the nonwoven fabric which hold the exoergic constituent which generate heat under existence of the air which mixed the resin which have thermofusion nature, and have permeability and absorptivity in the upper layer in the shape of a sheet by heating compression of a superposition heating compressor on the top face of the sheet-like object which consist of the paper or the nonwoven fabric which have permeability and absorptivity.

[Claim 10]

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## CLAIMS

[Claim(s)]
[Claim 1] The sheet-like heating element characterized by to infiltrate water or an inorganic electrolyte water solution into it after fabricating the sheet-like object which consists of the paper or the nonwoven fabric which holds the exoergic constituent which generates heat under existence of the air which mixed the resin which has thermofusion nature, and has permeability and absorptivity in the upper layer in the shape of a sheet by heating compression of a superposition heating compressor on the top face of the sheet-like object which consists of the paper or the nonwoven fabric which has permeability and absorptivity.
[Claim 2] On the top face of the sheet-like object which consists of the paper or the nonwoven fabric which has permeability and absorptivity The exoergic constituent which generates heat under existence of the air which mixed the resin which has thermofusion nature is held. The sheet-like heating element characterized by infiltrating water or an inorganic electrolyte water solution from the field which has permeability and absorptivity after fabricating the sheet-like object which becomes the upper layer from the paper of non-permeability and non-absorptivity, a nonwoven fabric, or a resin film in the shape of a sheet by heating compression of a superposition heating compressor.
[Claim 3] The sheet-like heating element according to claim 1 or 2 characterized by mixing the resin which has thermofusion nature in order that an exoergic constituent may use reduced iron powder, activated carbon or reduced iron powder, activated carbon, and a water retention agent as a principal component and may use mixed powder of the exoergic constituent as a sheet-like Plastic solid.
[Claim 4] The mixed powder of the exoergic constituent which generates heat under existence of the air which mixed the resin which has thermofusion nature on the top face of a sheet-like object is held. The voidage of the sheet-like heating element fabricated by heating compression of a superposition heating compressor in the shape of a sheet the sheet-like object which becomes the upper layer from the paper or the nonwoven fabric which has permeability and absorptivity 30 - 85%, The sheet-like heating element according to claim 1 or 2 characterized by thickness being 0.2-10mm.
[Claim 5] The mixed powder of the exoergic constituent which generates heat under existence of the air which mixed the resin which has thermofusion nature on the top face of a sheet-like object is held. The sheet-like object which becomes the upper layer from the paper or the nonwoven fabric which has permeability and absorptivity by heating compression of a superposition heating compressor The permeability of the sheet-like heating element fabricated in the shape of a sheet is JIS. Sheet-like heating element according to claim 1 or 2 characterized by being 0.1-20sec / 100ml with the test method of S-8117.
[Claim 6] The sheet-like heating element according to claim 1 or 2 by which 2 and thickness are 10-2000 micrometers 10cm, and the coefficient of water absorption of the sheet-like object which consists of the paper and the nonwoven fabric which have permeability, water flow nature, and absorptivity is being [ a basis weight / 5 - 800 g/m2 ] characterized 0.3-10g / when basis weights are 5 - 600 g/m2 and a nonwoven fabric in the case of paper.
[Claim 7] The sheet-like heating element according to claim 1 or 2 which it is characterized by

the thermoplastics powde[redacted]h which the resin which has the thermo[redacted]n nature mixed to an exoergic constituent is chosen from polyamide powder, polyester powder, polyethylene powder, ethylene acetic-acid vinyl copolymer powder (EVA), polyurethane powder, etc. using at least one or more sorts as a principal component, and is the addition of the three to 30 section to the exoergic constituent 100 section.

[Claim 8] The sheet-like heating element according to claim 1 or 2 characterized by the amount of sinking in of water or an inorganic electrolyte water solution being an addition of the ten to 50 section to the sheet-like heating element 100 section.

[Claim 9] The manufacture approach of the sheet-like heating element characterize by to infiltrate water or an inorganic electrolyte water solution into it after fabricate the sheet-like object which consist of the paper or the nonwoven fabric which hold the exoergic constituent which generate heat under existence of the air which mixed the resin which have thermofusion nature, and have permeability and absorptivity in the upper layer in the shape of a sheet by heating compression of a superposition heating compressor on the top face of the sheet-like object which consist of the paper or the nonwoven fabric which have permeability and absorptivity.

[Claim 10] On the top face of the sheet-like object which consists of the paper or the nonwoven fabric which has permeability and absorptivity The exoergic constituent which generates heat under existence of the air which mixed the resin which has thermofusion nature is held. After fabricating the paper of non-permeability and non-absorptivity, a nonwoven fabric, or a resin film in the shape of a sheet by heating compression of a superposition pressurization compressor in the upper layer, The manufacture approach of the sheet-like heating element characterized by infiltrating water or an inorganic electrolyte water solution from the sheet-like object surface which consists of the paper or the nonwoven fabric which has permeability and absorptivity.

[Claim 11] The manufacture approach of the sheet-like heating element according to claim 9 or 10 characterized by the sheet-like object which consists of paper or a nonwoven fabric by the scattering method sprinkling the exoergic constituent with which the resin which has thermofusion nature is mixed.

[Claim 12] The manufacture approach of the sheet-like heating element according to claim 9 or 10 characterized by for the pressure of a compressor being 0.1-10.0kg/cm2, and a temperature requirement being 70-250 degrees C at the time of manufacture of a sheet-like heating element.

[Claim 13] The manufacture approach of the sheet-like heating element according to claim 9 or 10 characterized by mixing the exoergic constituent with which the resin which has thermofusion nature is mixed by the approach of powder-mixing equipments (tumbler etc.).

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## DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] If this invention contacts air, it will generate heat, and it relates to the sheet-like heating element which can be used being able to cut into the configuration and magnitude of arbitration, and its manufacture approach.
[0002]
[Description of the Prior Art] As a means to warm oneself, oxidizability metals, such as iron powder, are used as a principal component, and the heating element contained by the bag which has permeability in the exoergic constituent which mixed activated carbon, a water retention agent, etc. which carry out water, salts, and catalyst-work as a reaction assistant, and which contacts air and generates heat has spread widely as disposable Cairo.
[0003] The exoergic constituent currently used for this heating element is contained into the bag (henceforth a PE liner) which prepared the suitable air hole for a front face, where the seal package of this is carried out consisting of an wrapping material of a non-breathable film further (henceforth an outside bag), it is marketed, and the above-mentioned PE liner is used for it at the time of use, picking it out from an outside bag.
[0004] Moreover, since an exoergic constituent moved within a PE liner with gravity etc. during a certain hemihedry and use and deviation arose, it not only produces sense of incongruity, but the advantage that these heating elements did not need ignition, either but use was easy reduced the wearing nature to the body remarkably, and fault, like the engine performance worsens had febrile ability.
[0005] In order to improve these faults, the heating element made into the shape of a sheet where an exoergic constituent is held or fastened to a base material etc. is proposed in the following official report.
[0006] For example, after holding the exothermic agent which mixed (1) nonsolvent mold adhesives in the bag which has permeability, The approach which heated from the outside and was pasted up on the inside of a bag (JP,5-33051,B), (2) How to carry out pressurization molding, after infiltrating an oxidation assistant into Japanese paper and sprinkling an exothermic agent (JP,64-42018,U), (3) How to carry out distributed maintenance of the exothermic agent at the sheet-like base material which the laminating of the fiber is carried out irregularly and has many detailed openings (JP,3-152894,A), (4) High absorptivity fiber is mixed as a base material, and the nonwoven fabric which has many openings is used. How (JP,7-59809,A) to make an exothermic agent hold to the opening, (5) It is the approach (JP,8-112303,A) of making superposition and a top face carry out spraying maintenance of the exothermic agent for the nonwoven fabric and nonwoven fabric which have many openings with adhesives, piling up the nonwoven fabric which has many openings further, and carrying out heating sticking by pressure etc.
[0007]
[Problem(s) to be Solved by the Invention] However, there are the following troubles in the sheet-like heating element obtained from the approach proposed in these official reports on manufacture as a heating element.

[0008] (1) When mix nonsolvent mold adhesives in a heating element to the bag which has permeability, the heating element into which salt water was infiltrated further is contained, heating compression is carried out from the outside and it fabricates in the shape of a sheet, since the heating element has sunk in salt water, and high heating compression temperature is needed and it compresses, from the permeability bag side which has detailed continuation pore, moisture flows out and the exoergic persistence time becomes short. Moreover, when adhesives processing is performed to the inside of the non-permeability bag section or an example is taken [ carry out / put a heating element into a bag and / heating compression ], an ingredient unit price is high and it becomes a cost rise by the reasons of manufacture becoming complicated.
(2) Since a heating element separates by bending, vibration, etc. or what was made to sprinkle, compress and hold a heating element on paper, and was made into the shape of a sheet breaks easily, it is not practical.
(3) After carrying out the laminating of the fiber irregularly and making the base material of the shape of a sheet which has many openings in the interior carry out distributed maintenance of the exoergic object, since suspension, such as activated carbon, is sprinkled, it is difficult to make it hold, where homogeneity is mixed.
(4) It is difficult to make the heating element which used the oxidizability metal powder as the principal component at the base material of the shape of a sheet with many openings hold, where homogeneity is mixed. Moreover, since high absorptivity fiber is expensive, an ingredient unit price becomes high.
(5) In order to pile up with adhesives the nonwoven fabric and nonwoven fabric which have many openings, the opening of a nonwoven fabric is buried, and it worsens and is hard coming to generate heat as it is air. Moreover, there is a problem of it being difficult to make the exoergic constituent with which mesh differs holding at same mixed rate as the nonwoven fabric which has an opening by vibration or reduced pressure suction, and being hard to acquire uniform febrility. Moreover, there is a process which piles up a nonwoven fabric with adhesives, and an ingredient unit price is high and it becomes a cost rise by the reasons of manufacture becoming complicated.
[0009] It was made in order that this invention might improve this conventional trouble, and an exoergic constituent is held at homogeneity and it aims at offering the sheet-like heating element which can be used being able to cut into arbitrary configurations and magnitude, and its manufacture approach.
[0010]
[Means for Solving the Problem] In order to attain the above-mentioned purpose invention according to claim 1 On the top face of the sheet-like object which consists of the paper or the nonwoven fabric which has permeability and absorptivity The exoergic constituent which generates heat under existence of the air which mixed the resin which has thermofusion nature is held. After fabricating the sheet-like object which becomes the upper layer from the paper or the nonwoven fabric which has permeability and absorptivity in the shape of a sheet by heating compression of a superposition heating compressor, it is characterized by infiltrating water or an inorganic electrolyte water solution.
[0011] In order to attain the above-mentioned purpose invention according to claim 2 On the top face of the sheet-like object which consists of the paper or the nonwoven fabric which has permeability and absorptivity The exoergic constituent which generates heat under existence of the air which mixed the resin which has thermofusion nature is held. After fabricating the sheet-like object which becomes the upper layer from the paper of non-permeability and non-absorptivity, a nonwoven fabric, or a resin film in the shape of a sheet by heating compression of a superposition heating compressor, it is characterized by infiltrating water or an inorganic electrolyte water solution from the field which has permeability and absorptivity.
[0012] Invention according to claim 3 is characterized by mixing the resin which has thermofusion nature, in order for an exoergic constituent to use reduced iron powder, activated carbon or reduced iron powder, activated carbon, and a water retention agent as a principal component in order to attain the above-mentioned purpose, and to use mixed powder of the exoergic constituent as a sheet-like molding object.

[0013] In order to attain the above-mentioned purpose invention according to claim 4 The mixed powder of the exoergic constituent which generates heat under existence of the air which mixed the resin which has thermofusion nature on the top face of a sheet-like object is held. It is characterized by being 0.2-10mm about 30 - 85%, and thickness in the voidage of the sheet-like heating element fabricated by heating compression of a superposition heating compressor in the shape of a sheet in the sheet-like object which becomes the upper layer from the paper or the nonwoven fabric which has permeability and absorptivity.

[0014] In order to attain the above-mentioned purpose invention according to claim 5 The mixed powder of the exoergic constituent which generates heat under existence of the air which mixed the resin which has thermofusion nature on the top face of a sheet-like object is held. The permeability of the sheet-like heating element fabricated by heating compression of a superposition heating compressor in the shape of a sheet in the sheet-like object which becomes the upper layer from the paper or the nonwoven fabric which has permeability and absorptivity is JIS. It is characterized by being 0.1-20sec / 100ml with the test method of S-8117.

[0015] In order to attain the above-mentioned purpose, the coefficient of water absorption of the sheet-like object which consists of the paper and the nonwoven fabric with which invention according to claim 6 has permeability, water flow nature, and absorptivity is being [ it / 5 - 800 g/m2 ] characterized by the basis weight, 0.3-10g / when 2 and thickness are 10-2000 micrometers 10cm and the basis weights in the case of paper are 5 - 600 g/m2 and a nonwoven fabric.

[0016] In order to attain the above-mentioned purpose, invention according to claim 7 is characterized by the thermoplastics powder with which the resin which has the thermofusion nature mixed to an exoergic constituent is chosen from polyamide powder, polyester powder, polyethylene powder, ethylene acetic-acid vinyl copolymer powder (EVA), polyurethane powder, etc. using at least one or more sorts as a principal component, and is taken as the addition of the three to 30 section to the exoergic constituent 100 section.

[0017] In order to attain the above-mentioned purpose, invention according to claim 8 is characterized by the amount of sinking in of water or an inorganic electrolyte water solution being an addition of the ten to 50 section to claim 1 or the sheet-like heating element 100 section carried out 2 ****s.

[0018] In order to attain the above-mentioned purpose invention according to claim 9 On the top face of the sheet-like object which consists of the paper or the nonwoven fabric which has permeability and absorptivity The exoergic constituent which generates heat under existence of the air which mixed the resin which has thermofusion nature is held. After fabricating the sheet-like object which becomes the upper layer from the paper or the nonwoven fabric which has permeability and absorptivity in the shape of a sheet by heating compression of a superposition heating compressor, it is characterized by infiltrating water or an inorganic electrolyte water solution.

[0019] In order to attain the above-mentioned purpose invention according to claim 10 On the top face of the sheet-like object which consists of the paper or the nonwoven fabric which has permeability and absorptivity The exoergic constituent which generates heat under existence of the air which mixed the resin which has thermofusion nature is held. After fabricating the paper of non-permeability and non-absorptivity, a nonwoven fabric, or a resin film in the shape of a sheet by heating compression of a superposition pressurization compressor in the upper layer, it is characterized by infiltrating water or an inorganic electrolyte water solution from the sheet-like object surface which consists of the paper or the nonwoven fabric which has permeability and absorptivity.

[0020] In order to attain the above-mentioned purpose, invention according to claim 11 is characterized by the sheet-like object which consists of paper or a nonwoven fabric by the scattering method sprinkling the exoergic constituent with which the resin which has the thermofusion nature indicated by claim 3 is mixed.

[0021] In order to attain the above-mentioned purpose, as for invention according to claim 12, the pressure of a compressor is characterized by 0.1-10.0kg/cm2 and a temperature

requirement being 70-250 degrees C at the time of manufacture of a sheet-like heating element.

[0022] In order to attain the above-mentioned purpose, invention according to claim 13 is characterized by mixing the exoergic constituent with which the resin which has thermofusion nature is mixed by the approach of powder-mixing equipments (tumbler etc.).
[0023]
[Embodiment of the Invention] The gestalt of implementation of this invention is explained in full detail with reference to a drawing. As shown in drawing 1 , the sheet-like heating element of this invention on the top face of the sheet-like object 1 which consists of the paper or the nonwoven fabric which has permeability, water flow nature, and absorptivity Spraying maintenance of the exoergic constituent 2 which mixed the hot melt resin which has thermofusion nature is carried out at homogeneity. After carrying out heating compression of the sheet-like object 3 which consists of the paper or the nonwoven fabric which has permeability, water flow nature, and absorptivity on it in piles and making it the shape of a sheet, water or an inorganic electrolysis water solution was infiltrated, and the following is used as sheet-like objects 1 and 3 which hold the exoergic constituent 2 from the upper and lower sides.
[0024] As an ingredient used for the sheet-like objects 1 and 3 which have permeability, water flow nature, and absorptivity, it is paper, a nonwoven fabric, etc. which were made from a vegetable fiber, a synthetic fiber, or the fiber of both mixing, and what uses as a principal component the vegetable fiber which was excellent in especially water retention capacity is desirable, and especially the thing that uses pulp, ****, cotton, etc. as a component is desirable. If it is in the paper or nonwoven fabric, it is required to have permeability suitable for generation of heat, water flow nature, and absorptivity. Desirably, when 10-2000 micrometers and a coefficient of water absorption are [ in the case of paper / 0.3-10g/10cm2 and a basis weight ] 5 - 600 g/m2 and a nonwoven fabric for thickness, for thickness, 10-2000 micrometers and a coefficient of water absorption are [ 0.3-10g/10cm2 and a basis weight ] 5 - 800 g/m2. The sheet-like objects 1 and 3 which are the above and which were obtained if out of range do not have sufficient permeability, and water holding capacity worsens, and febrility falls.
[0025] The paper of non-permeability and non-absorptivity, a nonwoven fabric, or the resin film of the sheet-like objects 1 and 3 which put the exoergic constituent 2 is sufficient as one of vertical both sides. As for the paper of non-permeability and non-absorptivity, a nonwoven fabric, or a resin film, it is desirable for thickness to be 10-2000 micrometers. If thinner than this when the sheet-like objects 1 and 3 are paper or a nonwoven fabric, the exoergic constituent 2 falls at the time of shaping sheet manufacture, or the lack of on the strength arises, and when it is a resin film, the lack of on the strength arises, and a shaping sheet cannot be obtained. In the case where it is thick again, the suitable heat for the exoergic constituent which mixed hot melt resin does not start. Moreover, problems, such as spoiling the flexibility of the obtained shaping sheet, arise.
[0026] On the other hand, as a febrile constituent 2, oxidizability metal powders, such as pure iron powder, reduced iron powder, electrolytic iron powder, aluminium powder, and nickel powder, are used as a principal component, and water retention agents, such as oxidization assistants, such as water, a sodium chloride, a calcium chloride, and activated carbon, and wood flour, diatomaceous earth, a zeolite, a leech stone, a vermiculite, activated clay, and macromolecule absorptivity resin, are mixed.
[0027] Moreover, in order to combine the febrile constituent 2 in the shape of a sheet, the thermoplastics powder chosen from the resin which has thermofusion nature, for example, polyamide powder, polyester powder, polyethylene powder, ethylene acetic-acid vinyl copolymer powder (EVA), polyurethane powder, polyvinyl alcohol, etc. mixes at least one or more sorts as a principal component. A mixed rate is the addition of the three to 30 section to the febrile constituent 100 section. The shaping of the shape of a sheet with few additions of thermoplastics itself cannot be performed, and when there are many additions, the permeability of a shaping sheet and water flow nature will be spoiled remarkably.
[0028] Next, the manufacture approach of the above-mentioned sheet-like heating element is explained. Spraying maintenance of the mixed powder of the exoergic constituent 2 which

generates heat under existe[redacted]of the air which mixed the hot melt resi[redacted]ch has thermofusion nature carries out by the scattering method at homogeneity, the heating compression of the sheet-like object 3 which consists of the paper or the nonwoven fabric which has permeability and absorptivity at the upper layer carries out with a superposition heating compressor, and it fabricates on a shaping sheet on sheet-like object 1 top face which consists of the paper or the nonwoven fabric which has permeability, water-flow nature, and absorptivity.

[0029] In case it fabricates, when the pressure of a heating compressor is low, the bonding strength of the exoergic constituent 2 is weak, sheet-like shaping cannot be performed, but when a pressure is high, the permeability of the fabricated shaping sheet, water flow nature, and absorptivity will be spoiled. Also in heating, when temperature is low, shaping is impossible, without the added thermoplastics fusing. In the case where temperature is high, thermoplastics will cover the exoergic constituent 2 and will spoil permeability, water flow nature, and water permeability. Therefore, as for a process condition, it is desirable for a pressure to be, while 0.1-10.0kg/cm2 and a temperature requirement are 70-250 degrees C.

[0030] For permeability, 0.1-20sec / 100ml, and voidage is [ the thickness of the fabricated sheet-like heating element ] 0.2-10mm 30 to 85% in JIS-8117 test method. In addition, voidage is the following, and makes and carries out measurement calculation. A sheet-like heating element is immersed in aliphatic saturated hydrocarbon, this is put into a desiccator, and it is mostly made a vacuum. It sets under a vacuum condition until air bubbles stop coming out from a sheet. If air bubbles stop coming out, it will return to atmospheric pressure. The weight augend of the sheet-like heating element at this time is measured, and voidage is computed by the following formula.

Voidage = volume of the specific gravity x100-/sheet-like heating element of the weight augend / aliphatic saturated hydrocarbon of a sheet-like heating element [0031] The sheet-like heating element obtained by the above approach is cut into the configuration of arbitration according to the purpose of use, and is held in the wrapping material with which water or an inorganic electrolyte water solution is infiltrated, and at least a part has permeability. The wrapping material to be used makes non-permeability one side which touches the body section, and makes permeability one side which meets. The wrapping materials used for the non-permeability bag section are non-permeability sheets, such as a multilayer sheet which made the inner layer the resin sheet which has heat-sealing nature, or the resin sheet which has heat-sealing nature, and use the following.

[0032] They are laminated films, such as a polyethylene film / nylon nonwoven fabric, a polyethylene film/synthetic paper, a polyethylene film / polyethylene foam sheet, and a polyethylene film / polyester nonwoven fabric. As for the wrapping material used for the permeability bag section, what has heat-sealing nature and permeability and has flexibility and heat retaining property is good. For example, the perforated resin sheet which performed a laminated film or piercing of nonwoven fabrics, fine porosity sheets, a fine porosity sheet, and a nonwoven fabric etc.

[0033] Moreover, exoergic temperature and a pattern can set the sheet-like heating element obtained by the above-mentioned approach as arbitration by the thickness of a sheet-like heating element, the configuration of the wrapping material which wraps the amount of sinking in of water or an inorganic electrolyte water solution, and a sheet-like heating element, etc. Therefore, this sheet-like heating element can consider the various usage. For example, the heat source which transpires efficiently the volatilization evapotranspiration nature matter (an insecticide, an aromatic, deodorant, etc.) into which disposable Cairo, paper, a nonwoven fabric, etc. were infiltrated can be considered.

[0034] (Example) Below, the example of this invention is explained. However, this invention is not limited to the following examples. In addition, % expresses weight % and the section expresses the weight section.

(Example 1) The heating element constituent which mixed the iron powder 60 section, the activated carbon 15 section, the diatomaceous earth 18 section, and the low-density-polyethylene powder 7 section with powder-mixing equipment in the paper of basis-weight 25 g/m2 was sprinkled by the scattering method within the limits of 10 g/m2 - 10000 g/m2.

Furthermore, the paper of [redacted]is-weight 25 g/m2 is put on the top face, [redacted]eating compression is performed according to each irrelevance in the range with a temperature [ of 70-200 degrees C ], and a pressure of 0.1-10.0kg/cm2, and the sheet of arbitration is obtained. The thickness of the obtained sheet was measured, the inorganic electrolyte water solution was added, and the existence of generation of heat was checked. The result is shown in Table 1.

[0035]

[Table 1]

表1

| 例 | 発熱シートの平均の厚さ（mm） | 発熱の有無 | 付着量 g／m² |
|---|---|---|---|
| 試作品1 | 0．15 | ×～△ | 190 |
| 試作品2 | 0．2 | ○ | 250 |
| 試作品3 | 0．5 | ○ | 630 |
| 試作品4 | 1．0 | ○ | 1250 |
| 試作品5 | 3．0 | ○ | 3750 |
| 試作品6 | 5．0 | ○ | 6250 |
| 試作品7 | 10．0 | ○ | 12500 |
| 試作品8 | 12．0 | ×～△ | 15000 |

○：30℃以上の発熱を確認。
△：室温～30℃未満の発熱を確認。
×：発熱を確認せず。

[0036] (Example 2) The heating element constituent which mixed the iron powder 60 section, the activated carbon 15 section, the diatomaceous earth 18 section, and the low-density-polyethylene powder 7 section with powder-mixing equipment in the paper of basis-weight 25 g/m2 was sprinkled by the scattering method. Furthermore, the paper of basis-weight 25 g/m2 was put on the top face, heating compression was performed according to each irrelevance in the range with a temperature [ of 70-200 degrees C ], and a pressure of 0.1-10.0kg/cm2, and the sheet of arbitration was obtained. The permeability of the obtained sheet was measured, the inorganic electrolyte water solution was added, and the existence of generation of heat was checked. The result is shown in Table 2.

[0037]

[Table 2]

表2

| 例 | 通気度(sec/100ml) | 発熱の有無 | 総合判定 |
|---|---|---|---|
| 試作品9 | 0．06 | × | × |
| 試作品10 | 0．1 | △～○ | ○ |
| 試作品11 | 2．3 | ○ | ○ |
| 試作品12 | 5．1 | ○ | ○ |
| 試作品13 | 11 | △～○ | ○ |
| 試作品14 | 16 | △～○ | ○ |
| 試作品15 | 22 | △～○※ | × |

○：30℃以上の発熱を確認。
△：室温～30℃未満の発熱を確認。
×：発熱を確認せず。
※：一定の発熱温度が得られない。

[0038] (Example 3) To the constituent which mixed the iron powder 60 section, the activated carbon 15 section, and the diatomaceous earth 18 section in the paper of basis-weight 25 g/m2, as the mixed rate of low-density-polyethylene powder became the two to 50 section, the heating element constituent which mixed them with powder-mixing equipment was sprinkled by the scattering method. Furthermore, the basis weight of 25g/the paper of m2 was put on the top face, and according to each irrelevance, heating compression was performed in the range with a temperature [ of 70-200 degrees C ], and a pressure of 0.1-10.0kg/cm2 so that a molding sheet might be obtained. The inorganic electrolyte water solution was added on the obtained sheet, and the existence of generation of heat was checked. The result is shown in Table 3.

[0039]

[Table 3]

表3

| 例 | ホットメルト樹脂混合割合 | 空隙率(%) | 成型性※1 | 発熱の有無※2 |
|---|---|---|---|---|
| 試作品16 | 2 | 80 | × | ○ |
| 試作品17 | 3 | 75 | ×～△ | ○ |
| 試作品18 | 5 | 75 | △ | ○ |
| 試作品19 | 10 | 69 | ○ | ○ |
| 試作品20 | 20 | 65 | ○ | ○ |
| 試作品21 | 30 | 62 | ○ | △～○ |
| 試作品22 | 50 | 46 | ○ | △ |
| 試作品23 | 55 | 25 | ○ | × |

※1

○：内容物のもれを認めない。内容物は十分に固定されている。
△：内容物がややもれる。固定がやや不十分である。
×：内容物がもれを認める。内容物は十分に固定されていない。

※2

○：30℃以上の発熱を確認。
△：室温～30℃未満の発熱を確認。
×：発熱を確認せず。

[0040] (Example 4) The heating element constituent which mixed the iron powder 59 section, the activated carbon 14 section, the diatomaceous earth 18 section, and the low-density-polyethylene powder 9 section with powder-mixing equipment in the paper of basis-weight 25 g/m2 was sprinkled by the scattering method so that it might become 2700 g/m2. Furthermore, the paper of basis-weight 25 g/m2 was put on the top face, heating compression was carried out on the temperature of 200 degrees C, and conditions with a pressure of 1kg/cm2, and the sheet of shaping was obtained. And this shaping sheet was cut to 8cmx11cm, 6g of brine with which the salt 15 section and the water 85 section were mixed was sprinkled, and the exoergic sheet was obtained. This exoergic sheet was contained to the PE liner with which one side consisted of compound sheets of the porosity film made from polypropylene, and a nylon nonwoven fabric, and one side consisted of polyethylene films, and it considered as the sheet-like heating element. This was sealed into the bag outside non-permeability, and it saved at the room temperature on the 3rd. It takes out from an outside bag three days after, and is JIS. The exoergic trial was performed with the exoergic test method based on S-4100. The result is shown in drawing 1 . As a result of the exoergic trial, 40 degrees C was exceeded in 8 minutes, and 55 degrees C of maximum temperatures were reached. The time amount which maintains 40 degrees C or more was about 11 hours. When this sheet-like heating element was actually used for the body, there is also no generating of the bias of an exoergic constituent etc., temperature with about 10 good hours was maintained, and flexibility was maintained in the meantime.

[0041] On the top face of the paper (basis weight: 25 g/m2, thickness:130micrometer) which has permeability and absorptivity, the iron powder 59 section, (Example 5) The spraying laminating of the exoergic constituent which mixed the activated carbon 14 section, the diatomaceous earth 18 section, and the low-density-polyethylene powder 9 section with powder-mixing equipment is carried out to homogeneity by the scattering method. Heating compression was carried out with the superposition heating compressor, and the paper (basis weight: 25 g/m2, thickness:130micrometer) which has permeability and absorptivity in the upper layer was fabricated in the shape of a sheet. In this way, the sheet-like heating element with a thickness of about 1.0mm was obtained. This sheet-like heating element was cut into 110mm by 80mm, the inorganic electrolyte water solution (7g) was infiltrated, and it held in the bag which made one side which meets the non-permeability sheet with which one side has heat-sealing nature with the wrapping material of the permeability sheet (quantity of airflow is 450sec(s) / 100ml with the method of examining JIS S-8117) which has heat sheet nature. 30mg (basis weight: 20 g/m2, thickness:50micrometer) of 90mm long and 60mm wide papers was infiltrated into the non-permeability sheet surface upper part of the bag containing a web-material heating element, and

they were made to fix the [redacted] pyrethroid compound of vaporization na[redacted]e, and 1-ethynyl-2-methyl-2-pentenyl-cis- / transformer-chrysanthemate (henceforth en pen thorin) to it at the non-permeability sheet surface of the above-mentioned bag. The transpiration of both en pen thorin was measured using what put the Cairo mixed powder which added the inorganic electrolyte water solution (7g) to the fine particles (21g) which mixed iron powder, the water retention agent, and the oxidation assistant at same rate to contrast, and was mixed into the same bag as a prototype. The result of having carried out comparison contrast of the case where Cairo is used conventionally is shown in Table 4 and drawing 2 . After carrying out the unit time amount trap of the vaporization steam of en pen thorin with a silica gel packed column for every fixed time amount, the acetone extracted and measurement analysis was carried out by gas chromatogram.

[0042]

[Table 4]

表4 経過時間／有効成分蒸散量

| 経過時間（hr） | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| シート状カイロ | 0.51 | 0.62 | 0.38 | 0.33 |
| 従来カイロ | 0.48 | 0.43 | 0.32 | 0.26 |

単位：mg／hr

[0043]

[Effect of the Invention] As explained in full detail above, this invention on the top face of the sheet-like object which consists of the paper or the nonwoven fabric which has permeability and absorptivity Mix the resin which has thermofusion nature, and the exoergic constituent which generates heat under existence of air, and homogeneity is made to carry out spraying maintenance. After fabricating the sheet-like object which becomes the upper layer from the paper or the nonwoven fabric which has permeability and absorptivity in the shape of a sheet by heating compression of a superposition heating compressor, From having held in the bag with which water or an inorganic electrolyte water solution is infiltrated, and at least a part has permeability Since it has completely the high opening [ be / nothing ], alias a wrap, by the resin which has thermofusion nature for the front face of an exoergic constituent and an exoergic constituent tends to react with air by this, while being able to make it generate heat by use reduction-of-working-hours time amount Since it can cut into the configuration and magnitude of arbitration, making the product which was rich in variety becomes possible.

[0044] Moreover, since it has the high opening while the sheet-like heating element which does not have sense of incongruity at the time of use is obtained, since it becomes a flexible sheet by infiltrating water or an inorganic electrolyte water solution, the paper or the nonwoven fabric which has permeability and absorptivity for both sides is not needed, but even if it uses one side as a non-permeability sheet, the febrility of homogeneity is acquired at the time of use.

[0045] Since the permeability of a sheet-like object is securable also for the paper or the nonwoven fabric which has permeability and absorptivity by carrying out sinking-in maintenance although the permeability in a sheet gets worse and generation of heat worsens if many water or inorganic electrolyte water solutions are furthermore infiltrated into an exoergic constituent, generation of heat can be made to maintain for a long time.

[0046] And since it is not necessary to add exoergic assistants, such as water, during manufacture while being able to carry out continuous molding to tabular [ with wide width of face ], it comes to be able to do manufacture cheaply from manufacture and preservation being possible also under existence of air the top in which the sheet forming from a thin object to a thick object is possible.

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[Translation done.]

* NOTICES *



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3.In the drawings, any words are not translated.

## DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the sectional view of the sheet-like heating element which becomes the gestalt of implementation of this invention.
[Drawing 2] It is the diagram showing the exoergic test result of the sheet-like heating element which becomes the gestalt of implementation of this invention.
[Drawing 3] It is the diagram showing the sheet-like heating element which becomes the gestalt of implementation of this invention, and the transpiration of conventional Cairo.
[Description of Notations]
1 3 — A sheet-like object, 2 — Exoergic constituent.

[Translation done.]

* NOTICES *



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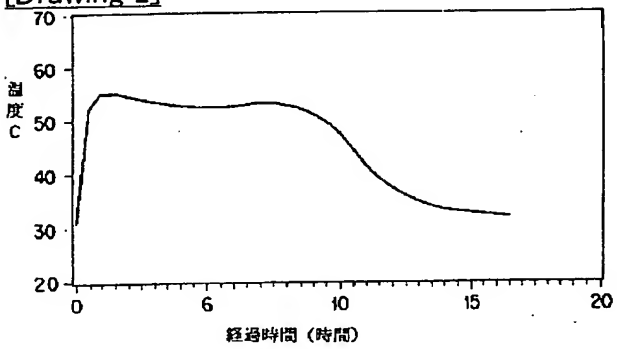
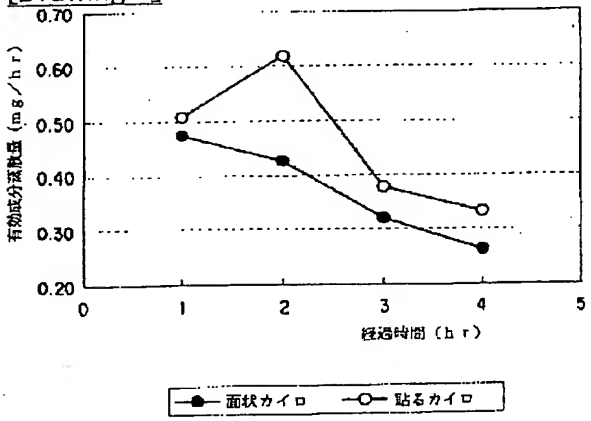
DRAWINGS

[Drawing 1]


[Drawing 2]




[Drawing 3]

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| | 7/02 | | | 7/02 | Ｄ　４Ｆ１００ |
| Ｂ３２Ｂ | 5/00 | | Ｂ３２Ｂ | 5/00 | Ｚ |
| | 7/02 | １０５ | | 7/02 | １０５ |
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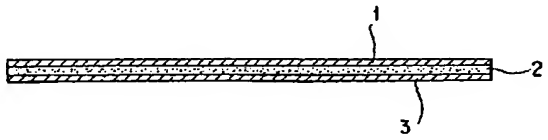
最終頁に続く

(54)【発明の名称】　シート状発熱体及びその製造方法

(57)【要約】
【課題】　発熱組成物が安定した状態で保持され、かつ任意な形状や大きさにカットして使用できるシート状発熱体を提供する。
【解決手段】　通気性と吸水性を有する紙または不織布よりなるシート状物１の上面に、熱溶融性を有する樹脂を混合した空気の存在下で発熱する発熱組成物２を保持し、その上層に通気性と吸水性を有する紙または不織布よりなるシート状物１を重ね合わせ加熱圧縮機の加熱圧縮によりシート状に成形した後、水または無機電解質水溶液を含浸させたもので、発熱組成物２が安定した状態で保持されていると共に、任意な形状や大きさにカットして使用できるため、使い勝手が大変よい。



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【特許請求の範囲】

【請求項１】　通気性と吸水性を有する紙または不織布よりなるシート状物の上面に、熱溶融性を有する樹脂を混合した空気の存在下で発熱する発熱組成物を保持し、その上層に通気性と吸水性を有する紙または不織布よりなるシート状物を重ね合わせ加熱圧縮機の加熱圧縮によりシート状に成形した後、水または無機電解質水溶液を含浸させたことを特徴とするシート状発熱体。

【請求項２】　通気性と吸水性を有する紙または不織布よりなるシート状物の上面に、熱溶融性を有する樹脂を混合した空気の存在下で発熱する発熱組成物を保持し、その上層に非通気性かつ、非吸水性の紙、不織布または樹脂フィルム等よりなるシート状物を重ね合わせ加熱圧縮機の加熱圧縮によりシート状に成形した後、通気性と吸水性を有する面から水または無機電解質水溶液を含浸させたことを特徴とするシート状発熱体。

【請求項３】　発熱組成物が還元鉄粉、活性炭または還元鉄粉、活性炭、保水剤を主成分とし、その発熱組成物の混合粉をシート状成形体にするために熱溶融性を有する樹脂を混入したことを特徴とする請求項１または２記載のシート状発熱体。

【請求項４】　シート状物の上面に、熱溶融性を有する樹脂を混合した空気の存在下で発熱する発熱組成物の混合粉を保持し、その上層に通気性と吸水性を有する紙または不織布よりなるシート状物を重ね合わせ加熱圧縮機の加熱圧縮によりシート状に成形されたシート状発熱体の空隙率が３０～８５％、厚さが０．２～１０ｍｍであることを特徴とする請求項１または２記載のシート状発熱体。

【請求項５】　シート状物の上面に熱溶融性を有する樹脂を混合した空気の存在下で発熱する発熱組成物の混合粉を保持し、その上層に通気性と吸水性を有する紙または不織布よりなるシート状物を重ね合わせ加熱圧縮機の加熱圧縮によりシート状に成形されたシート状発熱体の通気度がＪＩＳ　Ｓ－８１１７の試験方法で０．１～２０ｓｅｃ／１００ｍｌであることを特徴とする請求項１または２記載のシート状発熱体。

【請求項６】　通気性、通水性、吸水性を有する紙及び不織布よりなるシート状物の吸水量が０．３～１０ｇ／１０ｃｍ²、厚さが１０～２０００μｍであって、紙の場合坪量が５～６００ｇ／ｍ²、不織布の場合坪量が５～８００ｇ／ｍ²であること特徴とする請求項１または２記載のシート状発熱体。

【請求項７】　発熱組成物に混合する熱溶融性を有する樹脂が、ポリアミド粉末、ポリエステル粉末、ポリエチレン粉末、エチレン酢酸ビニール共重合体粉末（ＥＶＡ）、ポリウレタン粉末などから選ばれる熱可塑性樹脂粉末が少なくとも１種以上を主成分とすることを特徴とし、発熱組成物１００部に対して、３～３０部の添加量である請求項１または２記載のシート状発熱体。

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【請求項８】　シート状発熱体１００部に対して、水または無機電解質水溶液の含浸量が１０～５０部の添加量であることを特徴とする請求項１または２記載のシート状発熱体。

【請求項９】　通気性と吸水性を有する紙または不織布よりなるシート状物の上面に、熱溶融性を有する樹脂を混合した空気の存在下で発熱する発熱組成物を保持し、その上層に通気性と吸水性を有する紙または不織布よりなるシート状物を重ね合わせ加熱圧縮機の加熱圧縮によりシート状に成形した後、水または無機電解質水溶液を含浸させたことを特徴とするシート状発熱体の製造方法。

【請求項１０】　通気性と吸水性を有する紙または不織布よりなるシート状物の上面に、熱溶融性を有する樹脂を混合した空気の存在下で発熱する発熱組成物を保持し、その上層に非通気性かつ、非吸水性の紙、不織布または樹脂フィルム等を重ね合わせ加圧圧縮機の加熱圧縮によりシート状に成形した後、通気性と吸水性を有する紙または不織布よりなるシート状物面から水または無機電解質水溶液を含浸させたことを特徴とするシート状発熱体の製造方法。

【請求項１１】　熱溶融性を有する樹脂が混入されている発熱組成物をスキャッタリング方式で紙または不織布よりなるシート状物に散布されることを特徴とする請求項９または１０記載のシート状発熱体の製造方法。

【請求項１２】　シート状発熱体の製造時、圧縮機の圧力が０．１～１０．０ｋｇ／ｃｍ²、温度範囲が７０～２５０℃であることを特徴とする請求項９または１０記載のシート状発熱体の製造方法。

【請求項１３】　熱溶融性を有する樹脂が混入されている発熱組成物が、粉体混合装置（タンブラ等）の方法で混合されることを特徴とする請求項９または１０記載のシート状発熱体の製造方法。

【発明の詳細な説明】

【０００１】

【発明の属する技術分野】この発明は空気と接触すると発熱し、かつ任意の形状や大きさにカットして使用することができるシート状発熱体及びその製造方法に関する。

【０００２】

【従来の技術】暖を取る手段として、鉄粉などの被酸化性金属を主成分とし、反応助剤として水、塩類、触媒的な働きをする活性炭および保水剤などを混合した、空気と接触して発熱する発熱組成物を通気性を有する袋に収納された発熱体が使い捨てカイロとして広く普及している。

【０００３】この発熱体に使用されている発熱組成物は、表面に適当な通気孔を設けた袋（以下内袋という）に収納し、これをさらに非通気性フイルムの包材からなる（以下外袋という）に密封包装した状態で市販されて

おり、使用時に上記内袋を外袋から取り出して使用するようになっている。

【０００４】またこれらの発熱体は点火も必要とせず使用が簡単であるという利点はある半面、使用中に発熱組成物が重力等により内袋内で移動し片寄りが生じたりするため、人体への装着性を著しく低下させ違和感を生じるばかりでなく、発熱性能も性能が悪くなる等の不具合があった。

【０００５】これら不具合を改善するため、発熱組成物を支持体などに保持または挟着した状態でシート状にした発熱体が下記の公報で提案されている。

【０００６】例えば、（１）非溶剤型接着剤を混合した発熱剤を通気性を有する包袋に収容した後、外部から加熱し、包袋の内面に接着させた方法（特公平５－３３０５１号公報）、（２）和紙に酸化助剤を含浸させ、発熱剤を散布した後、加圧成型する方法（実開昭６４－４２０１８号公報）、（３）繊維が不規則に積層されて多数の微細な空隙を有するシート状支持体に発熱剤を分散保持する方法（特開平３－１５２８９４号公報）、（４）支持体として高吸水性繊維が混紡され、多数の空隙を有する不織布を用い、その空隙に発熱剤を保持せしめる方法（特開平７－５９８０９号公報）、（５）多数の空隙を有する不織布と不織布を接着剤で重ね合わせ、上面に発熱剤を散布保持させ、更に多数の空隙を有する不織布を重ね合わせて加熱圧着する方法（特開平８－１１２３０３号公報）などである。

【０００７】

【発明が解決しようとする課題】しかしこれら公報で提案されている方法から得られたシート状発熱体には、製造上、あるいは発熱体として、次のような問題点がある。

【０００８】（１）通気性を有する包袋へ発熱体の中に非溶剤型接着剤を混合し、さらに塩水を含浸させた発熱体を収納し、外部から加熱圧縮してシート状に成形する時、発熱体が塩水を含浸しているため高い加熱圧縮温度が必要となり、かつ、圧縮をするので微細連続気孔を有する通気性包袋面より水分が流出し発熱持続時間が短くなる。また、非通気性包袋部の内面に接着剤加工をほどこしたり、発熱体を包袋に入れ加熱圧縮するなど鑑みた時、材料単価が高く、製造が煩雑になる等の理由でコストアップになる。

（２）発熱体を紙の上に散布し、圧縮して保持させシート状としたものは折り曲げや振動などによって発熱体が剥がれたり、容易に壊れるため実用的でない。

（３）繊維が不規則に積層され、内部に多数の空隙のあるシート状の支持体に発熱物を分散保持させた後、活性炭などの懸濁液を散布するので均一に混合された状態で保持させることが難しい。

（４）多数の空隙のあるシート状の支持体に被酸化性金属粉を主成分とした発熱体を均一に混合された状態で保持させることが難しい。また、高吸水性繊維が高価であるため材料単価が高くなる。

（５）多数の空隙を有する不織布と不織布を接着剤で重ね合わせるため不織布の空隙が埋まり、空気の通りが悪くなって発熱しにくくなる。また、メッシュの異なる発熱組成物を振動または減圧吸引で空隙を有する不織布に同じ混合割合で保持させることが難しく、均一な発熱性が得にくいという問題がある。また、不織布を接着剤で重ね合わせる工程があり、材料単価が高く、製造が煩雑になる等の理由でコストアップになる。

【０００９】この発明はかかる従来の問題点を改善するためになされたもので、発熱組成物が均一に保持され、かつ任意な形状や大きさにカットして使用できるシート状発熱体及びその製造方法を提供することを目的とするものである。

【００１０】

【課題を解決するための手段】上記目的を達成するため請求項１記載の発明は、通気性と吸水性を有する紙または不織布よりなるシート状物の上面に、熱溶融性を有する樹脂を混合した空気の存在下で発熱する発熱組成物を保持し、その上層に通気性と吸水性を有する紙または不織布よりなるシート状物を重ね合わせ加熱圧縮機の加熱圧縮によりシート状に成形した後、水または無機電解質水溶液を含浸させたことを特徴とする。

【００１１】上記目的を達成するため請求項２記載の発明は、通気性と吸水性を有する紙または不織布よりなるシート状物の上面に、熱溶融性を有する樹脂を混合した空気の存在下で発熱する発熱組成物を保持し、その上層に非通気性かつ、非吸水性の紙、不織布または樹脂フィルム等よりなるシート状物を重ね合わせ加熱圧縮機の加熱圧縮によりシート状に成形した後、通気性と吸水性を有する面から水または無機電解質水溶液を含浸させたことを特徴とする。

【００１２】上記目的を達成するため請求項３記載の発明は、発熱組成物が還元鉄粉、活性炭または還元鉄粉、活性炭、保水剤を主成分とし、その発熱組成物の混合粉をシート状成型体にするために熱溶融性を有する樹脂を混入したことを特徴とする。

【００１３】上記目的を達成するため請求項４記載の発明は、シート状物の上面に、熱溶融性を有する樹脂を混合した空気の存在下で発熱する発熱組成物の混合粉を保持し、その上層に通気性と吸水性を有する紙または不織布よりなるシート状物を重ね合わせ加熱圧縮機の加熱圧縮によりシート状に成形されたシート状発熱体の空隙率を３０～８５％、厚さを０．２～１０ｍｍであることを特徴とする。

【００１４】上記目的を達成するため請求項５記載の発明は、シート状物の上面に熱溶融性を有する樹脂を混合した空気の存在下で発熱する発熱組成物の混合粉を保持し、その上層に通気性と吸水性を有する紙または不織布

よりなるシート状物を重ね合わせ加熱圧縮機の加熱圧縮によりシート状に成形されたシート状発熱体の通気度がＪＩＳ　Ｓ－８１１７の試験方法で０．１～２０ｓｅｃ／１００ｍｌであることを特徴とする。

【００１５】上記目的を達成するため請求項６記載の発明は、通気性、通水性、吸水性を有する紙及び不織布よりなるシート状物の吸水量が０．３～１０ｇ／１０ｃｍ²、厚さが１０～２０００μｍであって、紙の場合の坪量が５～６００ｇ／ｍ²、不織布の場合坪量を５～８００ｇ／ｍ²であること特徴とする。

【００１６】上記目的を達成するため請求項７記載の発明は、発熱組成物に混合する熱溶融性を有する樹脂が、ポリアミド粉末、ポリエステル粉末、ポリエチレン粉末、エチレン酢酸ビニール共重合体粉末（ＥＶＡ）、ポリウレタン粉末などから選ばれる熱可塑性樹脂粉末が少なくとも１種以上を主成分とすることを特徴とし、発熱組成物１００部に対して、３～３０部の添加量としたものである。

【００１７】上記目的を達成するため請求項８記載の発明は、請求項１または２記載されたシート状発熱体１００部に対して、水または無機電解質水溶液の含浸量が１０～５０部の添加量であることを特徴とする。

【００１８】上記目的を達成するため請求項９記載の発明は、通気性と吸水性を有する紙または不織布よりなるシート状物の上面に、熱溶融性を有する樹脂を混合した空気の存在下で発熱する発熱組成物を保持し、その上層に通気性と吸水性を有する紙または不織布よりなるシート状物を重ね合わせ加熱圧縮機の加熱圧縮によりシート状に成形した後、水または無機電解質水溶液を含浸させたことを特徴とする。

【００１９】上記目的を達成するため請求項１０記載の発明は、通気性と吸水性を有する紙または不織布よりなるシート状物の上面に、熱溶融性を有する樹脂を混合した空気の存在下で発熱する発熱組成物を保持し、その上層に非通気性かつ、非吸水性の紙、不織布または樹脂フイルム等を重ね合わせ加圧圧縮機の加熱圧縮によりシート状に成形した後、通気性と吸水性を有する紙または不織布よりなるシート状物面から水または無機電解質水溶液を含浸させたことを特徴とする。

【００２０】上記目的を達成するため請求項１１記載の発明は、請求項３に記載された熱溶融性を有する樹脂が混入されている発熱組成物をスキャッタリング方式で紙または不織布よりなるシート状物に散布されることを特徴とする。

【００２１】上記目的を達成するため請求項１２記載の発明は、シート状発熱体の製造時、圧縮機の圧力が０．１～１０．０ｋｇ／ｃｍ²、温度範囲が７０～２５０℃であることを特徴とする。

【００２２】上記目的を達成するため請求項１３記載の発明は、熱溶融性を有する樹脂が混入されている発熱組成物が、粉体混合装置（タンブラ等）の方法で混合されることを特徴とする。

【００２３】

【発明の実施の形態】この発明の実施の形態を図面を参照して詳述する。この発明のシート状発熱体は図１に示すように、通気性と通水性、吸水性を有する紙または不織布よりなるシート状物１の上面に、熱溶融性を有するホットメルト樹脂を混合した発熱組成物２を均一に散布保持し、その上に通気性と通水性、吸水性を有する紙または不織布よりなるシート状物３を重ねて加熱圧縮してシート状にした後、水または無機電解水溶液を含浸させたもので、発熱組成物２を上下より保持するシート状物１，３としては次のようなものが使用されている。

【００２４】通気性、通水性、吸水性を有するシート状物１，３に使用する材料としては、植物繊維、合成繊維または両者混合の繊維等からできた紙、不織布等であって、特に保水能力の優れた植物繊維を主成分とするものが好ましく、パルプ、麻綿、木綿などを成分とするものが特に好ましい。その紙または不織布にあっては、発熱の為に適当な通気性、通水性、吸水性を有する事が必要である。望ましくは、紙の場合、厚さが１０～２０００μｍ、吸水量が０．３～１０ｇ／１０ｃｍ²、坪量が５～６００ｇ／ｍ²、不織布の場合は、厚さが１０～２０００μｍ、吸水量が０．３～１０ｇ／１０ｃｍ²、坪量が５～８００ｇ／ｍ²である。上記の範囲外では、得られたシート状物１，３は、十分な通気性を持たなかったり、また保水力が悪くなり、発熱性が低下する。

【００２５】発熱組成物２を挟み込むシート状物１，３は上下両面のどちらか一方が非通気性、非吸水性の紙、不織布または樹脂フイルム等でもかまわない。非通気性、非吸水性の紙、不織布または樹脂フイルム等は、厚さが１０～２０００μｍであることが望ましい。シート状物１，３が紙または不織布の場合は、これ以上薄いと、成形シート製造時に発熱組成物２がこぼれたり、強度不足が生じ、また樹脂フィルムの場合は、強度不足が生じて成形シートを得ることが出来ない。また厚い場合ではホットメルト樹脂を混合した発熱組成物に適当な熱がかからない。また、得られた成形シートの柔軟性を損なうなどの問題が生じる。

【００２６】一方、発熱性組成物２としては純鉄粉、還元鉄粉、電解鉄粉、アルミニウム粉、ニッケル粉等の被酸化性金属粉を主成分とし、水、塩化ナトリウム、塩化カルシウムおよび活性炭などの酸化助剤および木粉、珪藻土、ゼオライト、ヒル石、バーミキュライト、活性白土、高分子吸水性樹脂等の保水剤が混合される。

【００２７】また、発熱性組成物２をシート状に結合させるために、熱溶融性を有する樹脂、例えばポリアミド粉末、ポリエステル粉末、ポリエチレン粉末、エチレン酢酸ビニール共重合体粉末（ＥＶＡ）、ポリウレタン粉末、ポリビニルアルコールなどから選ばれる熱可塑性樹

脂粉末が少なくとも１種以上を主成分として混合する。混合割合は発熱性組成物１００部に対して、３～３０部の添加量である。熱可塑性樹脂の添加量が少ないシート状の成形そのものができず、また、添加量が多い場合は、成形シートの通気性、通水性を著しく損ねてしまう。

【００２８】次に上記シート状発熱体の製造方法を説明する。通気性、通水性、吸水性を有する紙または不織布よりなるシート状物１上面に、熱溶融性を有するホットメルト樹脂を混合した空気の存在下で発熱する発熱組成物２の混合粉をスキャッタリング方式で均一に散布保持し、その上層に通気性と吸水性を有する紙または不織布よりなるシート状物３を重ね合わせ加熱圧縮機で加熱圧縮して成形シートに成形する。

【００２９】成形する際、加熱圧縮機の圧力が低い場合は、発熱組成物２の結合力が弱く、シート状の成形ができず、圧力が高い場合は、成形された成形シートの通気性、通水性、吸水性が損なわれてしまう。加熱においても、温度が低い場合は添加した熱可塑性樹脂が溶融せずに成形ができない。温度が高い場合では、熱可塑性樹脂が発熱組成物２を覆ってしまい、通気性、通水性、透水性を損なってしまう。そのため、成形条件は圧力が０．１～１０．０ｋｇ／ｃｍ$^2$、温度範囲が７０～２５０℃の間であることが望ましい。

【００３０】成形されたシート状発熱体は、通気度がＪＩＳ－８１１７試験方法で０．１～２０ｓｅｃ／１００ｍｌ、空隙率が３０～８５％、厚さが０．２～１０ｍｍである。なお、空隙率は以下のようにして測定算出したものである。シート状発熱体を脂肪族飽和炭化水素に浸漬し、これをデシケーターに入れて、ほぼ真空にする。シートから気泡が出なくなるまで、真空条件下におく。気泡が出なくなったら、大気圧に戻す。この時のシート状発熱体の重量増加量を測定し、下記の式で空隙率を算出する。

空隙率＝シート状発熱体の重量増加量／脂肪族飽和炭化水素の比重×１００／シート状発熱体の体積

【００３１】以上の方法で得られたシート状発熱体は、使用目的に応じて任意の形状にカットし、水または無機電解質水溶液を含浸させて少なくとも一部が通気性を有する包材に収容したものである。使用する包材は身体部に接する片面を非通気性とし、対面する片面を通気性とする。非通気性包袋部に用いられる包材はヒートシール性を有する樹脂シート、または、ヒートシール性を有する樹脂シートを内層にした多層シート等の非通気性シートで、次のようなものを用いる。

【００３２】ポリエチレンフイルム／ナイロン不織布、ポリエチレンフイルム／合成紙、ポリエチレンフイルム／発泡ポリエチレンシート、ポリエチレンフイルム／ポリエステル不織布等の積層フイルムである。通気性包袋部に用いられる包材はヒートシール性と通気性を有し、柔軟性、保温性を有するものが良い。例えば、不織布類、微多孔性シート類、微多孔性シートと不織布の積層フイルムまたは穿孔加工等を施した有孔樹脂シート等。

【００３３】また上記方法で得られたシート状発熱体は、シート状発熱体の厚さや、水または無機電解質水溶液の含浸量、シート状発熱体を包む包材の構成等により、発熱温度及びパターンが任意に設定可能となっている。従ってこのシート状発熱体は、様々な利用方法が考えられる。例えば、使い捨てカイロや紙、不織布等に含浸させた揮発蒸散性物質（殺虫剤、芳香剤、消臭剤など）を効率よく蒸散させる熱源などが考えられる。

【００３４】（実施例）以下に、この発明の実施例を説明する。ただし、この発明は以下の実施例に限定されるものではない。なお％は重量％、部は重量部を表す。

（実施例１）坪量２５ｇ／ｍ$^2$の紙上に鉄粉６０部、活性炭１５部、珪藻土１８部、低密度ポリエチレン粉末７部を粉体混合装置にて混合した発熱体組成物を１０ｇ／ｍ$^2$～１００００ｇ／ｍ$^2$の範囲内でスキャッタリング方式にて散布した。さらにその上面に坪量２５ｇ／ｍ$^2$の紙を載せ、各散布量に合わせて、温度７０～２００℃、圧力０．１～１０．０ｋｇ／ｃｍ$^2$の範囲で加熱圧縮を行い、任意のシートを得る。得られたシートの厚さを測定し、無機電解質水溶液を添加して発熱の有無を確認した。その結果を表１に示す。

【００３５】

【表１】

表１

| 例 | 発熱シートの平均の厚さ（ｍｍ） | 発熱の有無 | 付着量 ｇ／ｍ$^2$ |
|---|---|---|---|
| 試作品１ | ０．１５ | ×～△ | １９０ |
| 試作品２ | ０．２ | ○ | ２５０ |
| 試作品３ | ０．５ | ○ | ６３０ |
| 試作品４ | １．０ | ○ | １２５０ |
| 試作品５ | ３．０ | ○ | ３７５０ |
| 試作品６ | ５．０ | ○ | ６２５０ |
| 試作品７ | １０．０ | ○ | １２５００ |
| 試作品８ | １２．０ | ×～△ | １５０００ |

○：３０℃以上の発熱を確認。
△：室温～３０℃未満の発熱を確認。
×：発熱を確認せず。

【００３６】（実施例２）坪量２５ｇ／ｍ$^2$の紙上に鉄粉６０部、活性炭１５部、珪藻土１８部、低密度ポリエチレン粉末７部を粉体混合装置にて混合した発熱体組成物をスキャッタリング方式で散布した。さらにその上面に坪量２５ｇ／ｍ$^2$の紙を載せ、各散布量に合わせて、温度７０～２００℃、圧力０．１～１０．０ｋｇ／ｃｍ$^2$の範囲で加熱圧縮を行い、任意のシートを得た。得られたシートの通気性を測定し、無機電解質水溶液を添加して発熱の有無を確認した。その結果を表２に示す。

【００３７】

【表２】

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表２

| 例 | 通気度(sec/100ml) | 発熱の有無 | 総合判定 |
|---|---|---|---|
| 試作品９ | ０．０６ | × | × |
| 試作品１０ | ０．１ | △～○ | ○ |
| 試作品１１ | ２．３ | ○ | ○ |
| 試作品１２ | ５．１ | ○ | ○ |
| 試作品１３ | １１ | △～○ | ○ |
| 試作品１４ | １６ | △～○ | ○ |
| 試作品１５ | ２２ | △～○※ | × |

○：３０℃以上の発熱を確認。
△：室温～３０℃未満の発熱を確認。
×：発熱を確認せず。
※：一定の発熱温度が得られない。

【００３８】（実施例３）坪量２５ｇ／ｍ² の紙上に鉄＊粉６０部、活性炭１５部、珪藻土１８部を混合した組成物に対して、低密度ポリエチレン粉末の混合割合が２～５０部になるようにして、それらを粉体混合装置にて混合した発熱体組成物をスキャッタリング方式で散布した。さらにその上面に坪量２５ｇ／ｍ² の紙を載せ、各散布量に合わせて、成型シートが得られるように温度７０～２００℃、圧力０．１～１０．０ｋｇ／ｃｍ² の範囲で加熱圧縮を行った。得られたシートに無機電解質水溶液を添加して発熱の有無を確認した。その結果を表３に示す。

【００３９】

【表３】

表３

| 例 | ホットメルト樹脂混合割合 | 空隙率(%) | 成型性※１ | 発熱の有無※２ |
|---|---|---|---|---|
| 試作品１６ | ２ | ８０ | × | ○ |
| 試作品１７ | ３ | ７５ | ×～△ | ○ |
| 試作品１８ | ５ | ７５ | △ | ○ |
| 試作品１９ | １０ | ６９ | ○ | ○ |
| 試作品２０ | ２０ | ６５ | ○ | ○ |
| 試作品２１ | ３０ | ６２ | ○ | △～○ |
| 試作品２２ | ５０ | ４６ | ○ | △ |
| 試作品２３ | ５５ | ２５ | ○ | × |

※１
○：内容物のもれを認めない。内容物は十分に固定されている。
△：内容物がややもれる。固定がやや不十分である。
×：内容物がもれを認める。内容物は十分に固定されていない。

※２
○：３０℃以上の発熱を確認。
△：室温～３０℃未満の発熱を確認。
×：発熱を確認せず。

【００４０】（実施例４）坪量２５ｇ／ｍ² の紙上に鉄粉５９部、活性炭１４部、珪藻土１８部、低密度ポリエチレン粉末９部を粉体混合装置にて混合した発熱体組成物を２７００ｇ／ｍ² になるようにスキャッタリング方式で散布した。さらにその上面に坪量２５ｇ／ｍ² の紙を載せ、温度２００℃、圧力１ｋｇ／ｃｍ² の条件で加熱圧縮して成形のシートを得た。そしてこの成形シートを８ｃｍ×１１ｃｍに切断し、食塩１５部、水８５部が混合された食塩水を６ｇ散布して発熱シートを得た。この発熱シートを片面がポリプロピレン製多孔膜とナイロン不織布の複合シート、片面がポリエチレンフイルムで構成された内袋に収納してシート状発熱体とした。これを非通気性の外袋に密封し室温にて３日保存した。３日後、外袋より取り出し、ＪＩＳ　Ｓ－４１００に基づく発熱試験方法で発熱試験を行った。その結果を図１に示す。発熱試験の結果、８分で４０℃を越え、最高温度５５℃に達した。４０℃以上を持続する時間は約１１時間であった。このシート状発熱体を実際に人体に使用したところ、発熱組成物の偏りなどの発生もなく、約１０時間程度良好な温度を持続し、その間柔軟性を維持していた。

【００４１】（実施例５）通気性と吸水性を有する紙（坪量：２５ｇ／ｍ² 、厚さ：１３０μｍ）の上面に鉄粉５９部、活性炭１４部、珪藻土１８部、低密度ポリエチレン粉末９部を粉体混合装置で混合した発熱組成物をスキャッタリング方式で均一に散布積層させ、その上層に通気性と吸水性を有する紙（坪量：２５ｇ／ｍ² 、厚さ：１３０μｍ）を重ね合わせ加熱圧縮機で加熱圧縮してシート状に成形した。こうして厚さ約１．０ｍｍのシート状発熱体を得た。このシート状発熱体を縦１１０ｍｍ×横８０ｍｍにカットして無機電解質水溶液（７ｇ）を含浸させ、片面がヒートシール性を有する非通気性シートと対面する片面をヒートシート性を有する通気性シート（通気量がＪＩＳ　Ｓ－８１１７の試験法で４５０ｓｅｃ／１００ｍｌ）の包材で作った包袋に収容した。シート材発熱体入り包袋の非通気性シート面上部に縦９０ｍｍ×横６０ｍｍの紙（坪量：２０ｇ／ｍ² 、厚さ：５０μｍ）に揮散性の高いビレスロイド化合物、１－エチニル－２－メチル－２－ペンテニル－シス／トランス－クリサンテマート（以下、エンペントリンという）を３０ｍｇ含浸させ、上記包袋の非通気性シート面に固定させた。対照に鉄粉、保水剤、酸化助剤を同じ割合で混

合した粉体（２１ｇ）に無機電解質水溶液（７ｇ）を加えて混合したカイロ混合粉を試作品と同様の包袋に入れたものを使用して両者のエンペントリンの蒸散量を測定した。従来カイロを使った場合を比較対照した結果を表４及び図２に示す。エンペントリンの揮散蒸気を一定時＊間毎にシリカゲル充填カラムで単位時間トラップした後、アセトンで抽出しガスクロマトグラムで測定分析した。

【００４２】

【表４】

表４　経過時間／有効成分蒸散量

| 経過時間（ｈｒ） | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| シート状カイロ | ０．５１ | ０．６２ | ０．３８ | ０．３３ |
| 従来カイロ | ０．４８ | ０．４３ | ０．３２ | ０．２６ |

単位：ｍｇ／ｈｒ

【００４３】

【発明の効果】この発明は以上詳述したように、通気性と吸水性を有する紙または不織布よりなるシート状物の上面に、熱溶融性を有する樹脂と空気の存在下で発熱する発熱組成物を混合し均一に散布保持させ、その上層に通気性と吸水性を有する紙または不織布よりなるシート状物を重ね合わせ加熱圧縮機の加熱圧縮によりシート状に成形した後、水または無機電解質水溶液を含浸させて、少なくとも一部が通気性を有する包袋に収容したことから、発熱組成物の表面を熱溶融性を有する樹脂で完全に覆うことなく高い空隙を有しており、これによって発熱組成物が空気と反応しやすいため、使用時短時間で発熱させることができると共に、任意の形状及び大きさにカットできるため、バラエティに富んだ製品作りが可能となる。

【００４４】また、水または無機電解質水溶液を含浸させることにより柔軟なシートになるため、使用時違和感のないシート状発熱体が得られると共に、高い空隙を有していることから、両面を通気性と吸水性を有する紙または不織布を必要とせず、片面を非通気性シートにしても使用時に均一の発熱性が得られる。

※【００４５】さらに発熱組成物に水または無機電解質水溶液を多く含浸させるとシート内の通気性が悪化して発熱が悪くなるが、通気性と吸水性を有する紙または不織布にも含浸保持させることにより、シート状物の通気性を確保できるので、発熱を長く持続させることができる。

【００４６】しかも薄い物から厚い物までのシート成形が可能である上、幅の広い板状に連続成形できると共に、製造中に水等の発熱助剤を添加する必要がないため、空気の存在下でも製造および保存が可能なことから、安価に製造ができるようになる。

【図面の簡単な説明】

【図１】この発明の実施の形態になるシート状発熱体の断面図である。

【図２】この発明の実施の形態になるシート状発熱体の発熱試験結果を示す線図である。

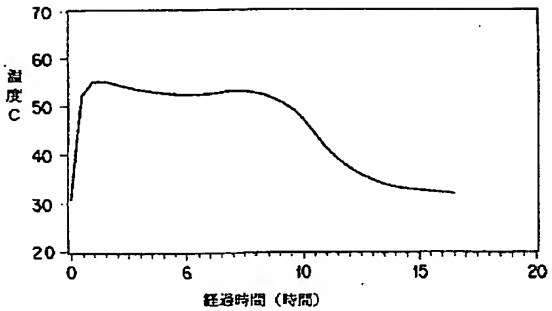
【図３】この発明の実施の形態になるシート状発熱体と従来のカイロの蒸散量を示す線図である。

【符号の説明】

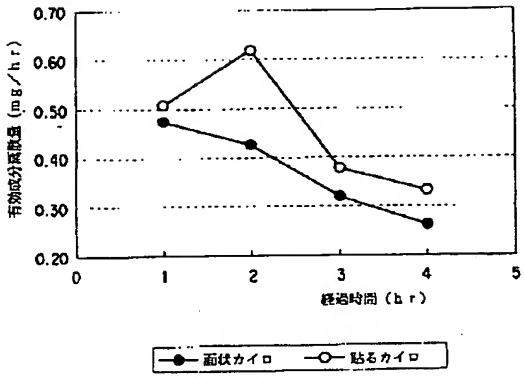
１，３…シート状物、２…発熱組成物。

【図１】


【図２】



【図３】

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